

ABSTRACT

A nitride semiconductor is grown on a silicon substrate by depositing a few mono-layers of aluminum to protect the silicon substrate from ammonia used during the growth process, and then forming a nucleation layer from aluminum nitride and a buffer structure including multiple superlattices of  $\text{Al}_R\text{Ga}_{(1-R)}\text{N}$  semiconductors having different compositions and an intermediate layer of GaN or other Ga-rich nitride semiconductor. The resulting structure has superior crystal quality. The silicon substrate used in epitaxial growth is removed before completion of the device so as to provide superior electrical properties in devices such as high-electron mobility transistors.